

**SECTION 27 15 00  
COMMUNICATIONS HORIZONTAL CABLING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. The project described herein covers a fiber telecommunications subsystem serving Building 12 at the Wm. S. Middleton Memorial Veterans Hospital in Madison, WI. Services and materials covered under this specification include provision, installation, termination hardware, testing and documentation.
- B. The contractor is responsible for all terminations in all locations indicated in this specification. As well as installation of necessary accessories, fiber optic cable ends and rack equipment in the existing telecommunications closets (TC) as indicated.

**1.2 RELATED WORK**

- A. Specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Specification Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.
- C. Specification Section 26 27 26, WIRING DEVICES.

**1.3 APPLICABLE PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in text by basic designation only. Except for a specific date given the issue in effect (including amendments, addenda, revisions, supplements, and errata) on the date the system's submittal is technically approved by VA, shall be enforced.
- B. National Fire Protection Association (NFPA):

70	NATIONAL ELECTRICAL CODE (NEC)
75	Protection of Electronic Computer/Data Processing Equipment
77	Recommended Practice on Static Electricity
	Standard for Health Care Facilities
101	Life Safety Code
1221	Emergency Services Communication Systems

- C. Underwriters Laboratories, Inc. (UL):

65	Wired Cabinets
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96	Lightning Protection Components
96A	INSTALLATION REQUIREMENTS FOR LIGHTNING PROTECTION SYSTEMS
467	Grounding and Bonding Equipment
497/497A/497B	PROTECTORS FOR PAIRED CONDUCTORS/ COMMUNICATIONS CIRCUITS/DATA COMMUNICATIONS AND FIRE ALARM CIRCUITS
884	Underfloor Raceways and Fittings

D. ANSI/EIA/TIA Publications:

568B	Commercial Building Telecommunications Wiring Standard
569B	Commercial Building Standard for Telecommunications Pathways and Spaces
606A	ADMINISTRATION STANDARD FOR THE TELECOMMUNICATIONS INFRASTRUCTURE OF COMMERCIAL BUILDINGS
607A	Grounding and Bonding Requirements for Telecommunications in Commercial Buildings
758	Grounding and Bonding Requirements for Telecommunications in Commercial Buildings

E. Lucent Technologies: Document 900-200-318 "Outside Plant Engineering Handbook".

F. International Telecommunication Union - Telecommunication Standardization Sector (ITU-T).

G. Federal Information Processing Standards (FIPS) Publications.

H. Federal Communications Commission (FCC) Publications: Standards for telephone equipment and systems.

I. United States Air Force: Technical Order 33K-1-100 Test Measurement and Diagnostic Equipment (TMDE) Interval Reference Guide.

J. Joint Commission on Accreditation of Health Care Organization (JCAHO): Comprehensive Accreditation Manual for Hospitals.

K. National and/or Government Life Safety Code(s): The more stringent of each listed code.

#### 1.4 QUALITY ASSURANCE

A. The authorized representative of the OEM, shall be responsible for the design, satisfactory total operation of the System, and its certification.

- B. The OEM shall meet the minimum requirements identified in Paragraph 2.1.A. additionally, the Contractor shall have had experience with three or more installations of systems of comparable size and complexity with regards to coordinating, engineering, testing, certifying, supervising, training, and documentation. Identification of these installations shall be provided as a part of the submittal as identified in Paragraph 1.5.
- C. The System Contractor shall submit certified documentation that they have been an authorized distributor and service organization for the OEM for a minimum of three (3) years. The System Contractor shall be authorized by the OEM to certify and warranty the installed equipment. In addition, the OEM and System Contractor shall accept complete responsibility for the design, installation, certification, operation, and physical support for the System. This documentation, along with the System Contractor and OEM certification must be provided in writing as part of the Contractor's Technical Submittal.
- D. All equipment, cabling, terminating hardware, TCOs, and patch cords shall be sourced from the certifying OEM or at the OEM's direction, and support the System design, the OEM's quality control and validity of the OEM's warranty.
- E. The Contractor's Telecommunications Technicians assigned to the System shall be fully trained, qualified, and certified by the OEM on the engineering, installation, and testing of the System. The Contractor shall provide formal written evidence of current OEM certification(s) for the installer(s) as a part of the submittal or to the VA Project Manager before being allowed to commence work on the System.

## **PART 2 - PRODUCTS**

### **2.1 SUBMITTALS**

- A. Prior to the start of work the Contractor shall submit, to the VA. Four (4) sets of Manufacturer's Data covering all products proposed. The submittals shall be original catalog sheets or photocopies.
- B. Contractor shall submit all written documentation from a bonafide installer training and certification program for all persons doing the installation. Certifications shall indicate the installers meet category 6 and current industry standards.
- C. Work shall not begin without the approval of the submitted items by the VA. The VA shall review the submittals and mark with approval and return to the Contractor.

## 2.2 TELECOMMUNICATION CLOSETS

- A. Existing TC"s include: (five total, in pathway order) Building 1, Room C125, Building 1, Room GB1-05A, Building 2, Room 117, Building 7 Room 111A, Building 12, Room 28.  
White)
- B. All required Termination Components shall be selected from distributor stock that is independently verified for performance. The manufacturer shall be **Panduit** to match the existing the Hospital backbone systems.

Panduit FAPWEIDL - LC FAP loaded with six LC duplex multimode fiber optic adapters (Electric Ivory) with phosphor bronze split sleeves.

Panduit FAP12WBUDLCZ - LC FAP loaded with six LC duplex singlemode fiber optic adapters (Blue) with zirconia ceramic split sleeves.

Panduit FCE1UA - Rack Mount Enclosure Open Access 1 RU.

Panduit FLCDSBUY - Singlemode duplex fiber optic connector.

Panduit FLCDMC6EIIY - multimode duplex fiber optic connector.

Reference VAAR 852.211-72 and FAR 52.211-6)

### **Bidding on:**

Manufacturer name \_\_\_\_\_

Brand \_\_\_\_\_

No. \_\_\_\_\_

## 2.3 TELECOMMUNICATIONS EQUIPMENT, HARDWARE & TERMINATION

- A. Multimode fibers shall be terminated and secured at both ends in "ST" type female stainless steel connectors installed in an appropriate patch or breakout panel with a cable management system. A 610 mm (2 ft.) cable loop (minimum) shall be provided at each end to allow for future movement.
- B. Single mode fibers shall be terminated and secured at both ends with "ST" type female stainless steel connectors installed in an appropriate patch or breakout panel. The panel shall be provided with a cable management system. A 610 mm (2 ft.) cable loop (minimum) shall be provided at each end to allow for future movement.
- C. In all TC's, all fiber optic cables shall be installed in the panels and racks in accordance with industry standards. Female "ST" connectors shall be provided and installed on the appropriate panel for termination of each strand.
- D. Fiber Optic:

- a. These units shall be metal-housed precision types in the frequency ranges selected. They shall be the screw-on type that has low VSWR when installed and the proper impedance to terminate the required system unit or fiber optic cable.
- b. Technical Characteristics:

Frequency	Lightwave
Power blocking	As required
Return loss	25 dB
Connectors	"ST", minimum
Construction	Stainless steel
Impedance	As required

E. Verification Tests:

- 1. Multimode Fiber Optic Cable: Perform end-to-end attenuation tests in accordance with ANSI/EIA/TIA-568-B.3 and ANSI/EIA/TIA-526-14A using Method A, Optical Power Meter and Light Source. Perform verification acceptance test on all fiber cable required to be terminated.
- 2. Single mode Fiber Optic Cable: Perform end-to-end attenuation tests in accordance with ANSI/EIA/TIA-568-B.3 and ANSI/EIA/TIA-526-7 using Method A, Optical Power Meter and Light Source. Perform verification acceptance test on all fiber cable required to be terminated.

F. Performance Testing:

Fiber Optic Links: Perform end-to-end fiber optic cable link tests in accordance with ANSI/EIA/TIA-568-B.3.

- G. The Contractor shall test each fiber optic strand. Cable transmission performance specifications shall be in accordance with EIA/TIA standards. Attenuation shall be measured in accordance with EIA fiber optic test procedures EIA/TIA-455-46, -61, or -53 and NFPA. Information transmission capacity shall be measured in accordance with EIA/TIA-455-51 or -30 and NFPA. The written results shall be provided to the RE for review and approval.
- H. In order to achieve a high level of reliability that approximates that of an OEM connector, field installable connectors shall have an OEM specified physical contact polish. Every fiber cable shall be terminated with the appropriate connector, and tested to ensure compliance to OEM and specifications outlines herein. Where a local fiber optic system connector standard, Industry Standard fiber optic "ST" female connector terminated with a fiber optic cable, shall be

used. But, if the fiber optic cable is not used (or "dark"), a "ST" male terminating "cap" shall be provided for each unused "ST" female connector.

- I. Panels shall be designed and installed in a fashion as to allow future station cabling to be terminated on the panel without disruption to existing connections.
- J. The contractor shall furnish and install as needed all vertical and horizontal cable management hardware on each rack to neatly and securely.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION - GENERAL**

- A. The contractor will be responsible for identifying and reporting to the VA Project Manager (VAPM) any existing damage to racks, equipment Telecommunications Closets, walls, and furnishings in the work area prior to start of work. All damage to interior spaces caused by the installation of equipment, terminations other hardware must be repaired. Repairs must match preexisting conditions.

#### **3.2 TELECOMMUNICATIONS CLOSET'S**

- A. Provide and install Rack Enclosures, Duplex multimode fiber optic adapters, Duplex singlemode fiber optic adapters, fiber optic termination ends and connectors in each of the following TC's as needed to provide connectivity from Building 12, Room 28 to Ground C-Wing, Room C125 of the main hospital. TC's include: (five total, in pathway order) Building 1- Room C125, Building 1- Room GB1-05A, Building 2- Room 117, Building 7- Room 111A, Building 12- Room 28. Fiber Optic cable is existing in place along the entire path way. Scope of work is to provide and install new rack enclosures, fiber optic adapters, termination ends, fiber optic end connectors, re-terminations on existing fiber optic cable to upgrade and provide end to end continuity from Building 12 to the Main Switch room C125. Removal and re-termination of existing fiber ends and connections may be necessary. Provide all equipment and labor necessary to terminate and provide functional end to end link(s).

#### **3.3 TELECOMMUNICATIONS CLOSET - (TC) EQUIPMENT**

- A. TC - Building 1, Room C125;  
Provide and install the following:  
One 3 Panel Open Access Rack Mounted Enclosure.

One 12 pair LC MM panel.

24 LC MM connectors for 24 strand fiber.

B. TC - Building 1, Room GB1-05A;

Provide and install the following:

one 3 Panel Open Access Rack Mounted Enclosure.

Two 12 pair LC MM panels,

48 LC MM connectors for the 24 strand fiber, in and out.

C. TC - Building 2, Room 117;

Provide and install the following:

one 3 Panel Open Access Rack Mounted Enclosure.

Two 12 pair LC MM panel.

48 LC MM connectors for 24 strand fiber.

D. TC - Building 7 Room 111A;

Provide and install the following:

One 3 Panel Open Access Rack Mounted Enclosure.

One 6 pair LC MM panel (in),

One 6 pair LC MM panel (out),

One 6 pair LC SM panel (out),

36 LC MM connectors

12 LC SM connectors.

E. TC - Building 12, Room 28;

Provide and install the following:

One 3 Panel Open Access Rack Mounted Enclosure.

One 6 pair LC MM panel

One 6 pair SM panel.

12 LC MM connectors,

12 LC SM connectors

F. TC - Building 12, Room 28;

Contractor to provide and install all labor and punch down equipment to make final terminations for the existing - 50 pair copper tele-wire cable and the existing fiber in the existing wall mounted IT enclosure.

### **3.3 TERMINATION HARDWARE**

- A. Telecommunications Outlet and Telecommunication Room termination hardware shall be designed to maintain the cable's pair twists as closely as possible to the point of mechanical termination. The installer shall insure that the twists are preserved to within 1/2" of the termination for all Cables.
- B. Termination Hardware (Blocks and Patch Panels) Positioning and Layout must be reviewed and approved by the VAPM or its agent prior to construction. The review does not exempt the Contractor from meeting any of the requirements stated in this document.
- C. All Cables, Telecommunications Outlets, Voice Blocks and Data Patch Panels shall be clearly labeled using a Code identifying the location as unique throughout the Facility. The labeling and administration of it shall be done as stated in the TIA/EIA-606-A, Administration Standard for Commercial Telecommunications Infrastructure. The labeling scheme shall be approved by the VA prior to implementation. ALL labeling must mechanically printed in black ink. Hand lettered designations are not acceptable. When labeling cables, self-laminating labels are to be wrapped around the cable (e.g. not a "flag").
  - 1. Telecommunications Outlets are to be labeled on the cover of the faceplate and on each cable terminated at that location within twelve (12) inches of the end of the jacket.
  - 2. In the Telecommunication Room, all Voice and Data Termination Hardware and cable shall be labeled with the ID corresponding to the faceplate number to which the component relates. Cables shall be positioned in sequence of the faceplate I.D. starting with the lowest number.

### **3.4 TESTING**

- A. Contractor is responsible for supplying all equipment and personnel necessary to conduct the acceptance tests. Contractor shall conduct acceptance testing according to a schedule coordinated with the VA. Representatives of the VA may be in attendance to witness the test procedures. The contractor shall offer adequate advance notice to the VA as to allow for such participation.
- B. All horizontal cables must be 100% tested and fault free. If any cable is found to be outside the specification defined herein, that cable and the associated terminations shall be replaced at the expense of the contractor. Upon completion, the applicable tests shall be repeated.



- C. Horizontal Cable testing shall be as follows:
1. Contractor shall perform all of the measurements required by TIA/EIA-568-B and/or 586-A channel test. All pair combinations shall be tested with compliance based upon the worst case pair combination.
  2. To determine Nominal Velocity of Propagation (NVP) values shall be calculated by the contractor by terminating a known length of cable as required by the tester manufacturer and performing the necessary test. This NVP will be utilized during the testing of the installed cable plant. This requirement can be waived if NVP data is available from the cable or tester manufacturer for the exact cable type under test.
  3. Testing shall be performed using a TIA Level III tester.
- D. At minimum, the VA may request that a 5% random field re-test be conducted on the cable system - at no additional cost - to verify documented findings.
- E. In the event results of the tests are not satisfactory, the Contractor shall make adjustments, replacement and changes as are necessary and shall then repeat the test or tests which disclosed faulty or defective material, equipment or installation method, and shall make additional tests as the Engineer deems necessary.

### **3.5 DOCUMENTATION**

- A. All pathways and spaces not dictated by the drawings shall be drafted, defined and submitted to the VA, by the contractor, prior to the start of the project. The contractor shall not start until the VAPM has approved the drawings in writing. Any work done by the contractor prior to approval when approval is required shall be removed at the expense of the contractor if the approval not be granted.
- B. Test reports may be submitted in hardcopy or electronic format. Hand written test reports are not acceptable.
- C. All test reports shall include the following:
1. Cable Manufacturer, Cable Model number/name, and NVP.
  2. Tester manufacturer, model, serial number, hardware and software version.
  3. Circuit ID number and project name.
  4. Autotest specification used.
  5. Overall pass/fail indication.

6. Results from all of the tests conducted as required by the TIA/EIA-568-A.

7. Contractors name, name of persons performing test, and date of test.

D. The contractor shall visually inspect all cabling and terminations to insure that they are complete and conform to the wiring pattern defined herein. The contractor shall provide to the VA w written certification that this inspection has been made.

### **3.6 AS-BUILTS**

A. Upon completion of cable plant installation and testing, the contractor shall provide a complete set of cable records documentation including:

1. Annotated floor plans showing the location of all Telecommunications Outlets as installed. The patch and routing of all cabling homeruns. Telecommunications outlets shall be identified by the Outlet I.D. and a unique symbol. Provide hard copy sets and an electronic version on AutoCAD software.

2. Termination field(s) and equipment rack layouts.

### **3.7 WARRANTY**

A. The Contractor shall warranty the cable system for a period of five (5) years on materials and on workmanship and installation, including all parts, components and subsystems proposed. The warranty shall commence upon satisfactory completion of all work, including test and documentation, relating to major system components. Provide documentation to the VA upon completion of the project for the five (5) year warranty.

B. Any cable or hardware that proves defective, inoperable or incorrectly installed that must be replaced, modified or repaired to meet test criteria shall be performed by the contractor at no additional costs to the VA. The contractor shall provide all labor, equipment and materials necessary to effect warranty repairs or to the proposed system.

C. All changes and/or repairs made by the contractor under warranty shall be labeled and documented to the VA as described by this document.

D. In the event that the contractor fails to respond to warranty repair requests in a timely manner, the VA may secure repair services from others and charge the contractor for the costs incurred. This action will not void any provisions of the ongoing warranty.

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